

# THE DEVELOPMENT OF A COMPACT POSITRON TOMOGRAPH FOR PROSTATE IMAGING

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We give design details and expected image results of a compact positron tomograph for prostate imaging that centers a patient between a pair of external curved detector banks (ellipse: 44 cm minor, 60 cm major axis). The distance between detector banks adjusts to allow patient access and to position the detectors as closely as possible for obtaining maximum sensitivity with patients of various sizes. Each bank is composed of two rows (axially) of 20 CTI PET Systems HR+ block detectors, forming two arcs that can be tilted to minimize attenuation. Compared to a conventional PET system, our camera uses about one-quarter the number of detectors and has almost two times higher solid angle coverage for a central point source, because the detectors are close to the patient. The detectors are read out by modified CTI HRRT data acquisition electronics. The individual detectors are angled in the plane to point towards the prostate to minimize resolution degradation in that region. Inter-plane septa extend 6 cm beyond the scintillator crystals to reduce random and scatter backgrounds. Average- to large- size patients will not be fully encircled by detector rings, causing incomplete sampling due to the side gaps. Monte Carlo simulations (including 20% randoms and 30% scatter fractions) demonstrate the feasibility of detecting and differentiating prostate tumors with a tumor to background ratio of 2:1, using a number of counts that should be achievable with a 5 minute scan after a 10 mCi injection (*e.g.*, carbon-11 choline). Simulations also predict minimal blurring in the 10 cm diameter central region for a wide range in patient size.

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